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Review Article

Analysis of Nexus Between Unemployment and Recession in India

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Abstract

The nexus between unemployment and recession in India highlights a critical economic relationship where downturns significantly impact job availability, deepening economic challenges and affecting the livelihoods of millions. In this study, the author reviewed the research on the nexus between unemployment rate and recessions in the US during 1948-2020 and in the UK during 1900-2023 and attempted to examine the cyclical relationship between unemployment rate and GDP growth during all recessions and economic crises from 1951 to 2023 in India. The paper explored that all the peaks of the unemployment rates are associated with troughs of the GDP growth rates in every recession in India, especially in 1957, 1965, 1966, 1972, 1979, and 2020, while in other economic crises in 1985-86, 1991, 2005-06, unemployment rates were either upswing or reached peak levels when GDP growth rates were either downswing or reached at troughs. There are marginal exceptions during cyclical fashions in association between them.

Keywords: *Cycle; Cyclical Trend; Growth Rate; Recession; Unemployment Rate*

Introduction

Generally, Indian unemployment data are very scarce and non-reliable, especially during the pre-reform period, for which no serious time series analysis is purely predictable to relate with other important macro-economic variables. However, the normal observations are that Indian unemployment trends are cyclically co-related with the recessions, including economic crises, which implied that upswings of the unemployment rate are consistent with downswings of the GDP growth rate of India from 1951 to 2023, in which the present analysis is interested.

The NSS 68th round (2011-12) recorded that India was growing with an underemployment situation, including a reduction of the work population ratio, labour force participation rate, and labour productivity during 1972-73 to 2011-12. Even Papola (2012) explained that India's employment elasticity with respect to GDP has been falling from 0.57 in 1972-73-1977-78 to 0.20 in 1999-00-2009-10. The growth of rural employment has reduced from 2.20% to 0.96%, and urban employment fell from 4.50% to 3.30% during the specified period. The growth of the employment rate in the organised sector has dwindled from 2.71% in 1973/78 to 0.7% in 2005/08. In a nutshell, the National Commission for Enterprises in the Government Sector (2009) revealed that the growth of the unemployment rate was 4.25% and the growth of the severe unemployment rate was 4.27% from 1993-94 to 2004-05, where employment in the public and private sectors has reduced sufficiently from 1983 to 2005 and the employment growth was cyclical in that period. World Bank data showed that the unemployment rate in India has been catapulting from 1991 to 2006, and then it started to dwindle till 2023 in an inverse V-shaped manner.

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The unemployment rate of India grew significantly at the rate of 1.17% per year linearly from 1951 to 2023, as observed from the regression equation of the trend line. However, the nonlinear regression from the trend line is shown below, containing four phases of cyclical fashions of upswing and downswing in which the t values of all coefficients are significant at less than 5% level.

$Log(x)=0.684+0.1206t-0.005t^2+0.0001t^3-7.25e^{-07}t^4+\Theta$

(4.37) * (4.18) * (-3.41) * (3.33) * (-3.39) *

R^2=0.62, F=27.87*, DW=1.35, n=73, x=unemployment rate, Θ=random error, *=significant at 5% level

Some scattered research did not confirm the overall reliable patterns of unemployment rates from 1951 to 2023 in India. In this paper, the author has endeavoured to study the patterns of cyclical relations between recessions and unemployment rates during the said period.

Literature Review

There are innumerable research works on the empirical verification of the nexus between unemployment rate and GDP growth rate in developed countries in the short run as well as in the long run. Analysis has been reviewed below, where the central focus lies on the nexus between recession and unemployment.

In all the recessions in the UK marked by shaded vertical lines, the employment rate is either on the upswing or reached its peak level from 1900 to 2023, which implies that recessions are accompanied by the rising unemployment rate. In the Great Depression, the unemployment rate reached its highest peak level, followed by 1919–21, 1980–81, 2008–09, and 2020, respectively (Figure 1).

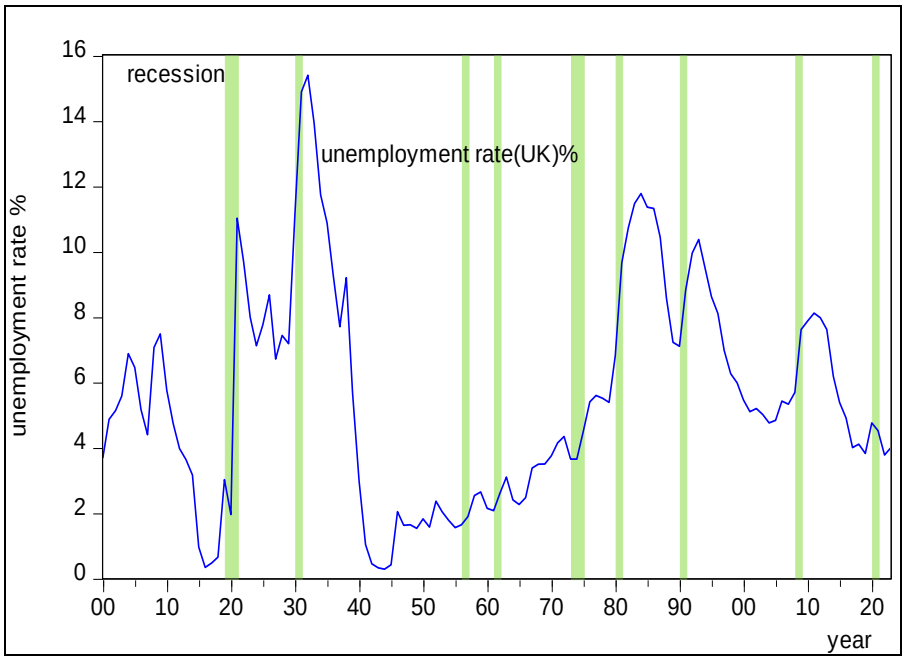

Figure 1: Employment and recession in UK

The US Bureau of Labour Statistics (2012) verified that the USA faced 10 recessions from 1948 to 2021, where the unemployment rate was 5% in 2007-December while the rate stood 10.0% in the recession in 2009-October, the unemployment rate was 10.8% in the 1982-83 recession. The long-term unemployment rate was highest in the 2008 recession, where the actual unemployment rate was 10.0%, while the long-term unemployment rate was only 2.6% in the 1982 recession, where the actual unemployment rate reached its peak level of 10.8%. The detail analysis is given in Figure 2.

Figure 2: Unemployment rate and long-term unemployment rate *(Source: US Bureau of Labour Statistics, 2012)*

During all recessions in the US, the cyclical patterns of male unemployment rate and female unemployment rate were more or less identical except in the periods of recessions in 1960, 1970, and 1975 (shaded bars) where women unemployment rates exceeded men (Figure 3).

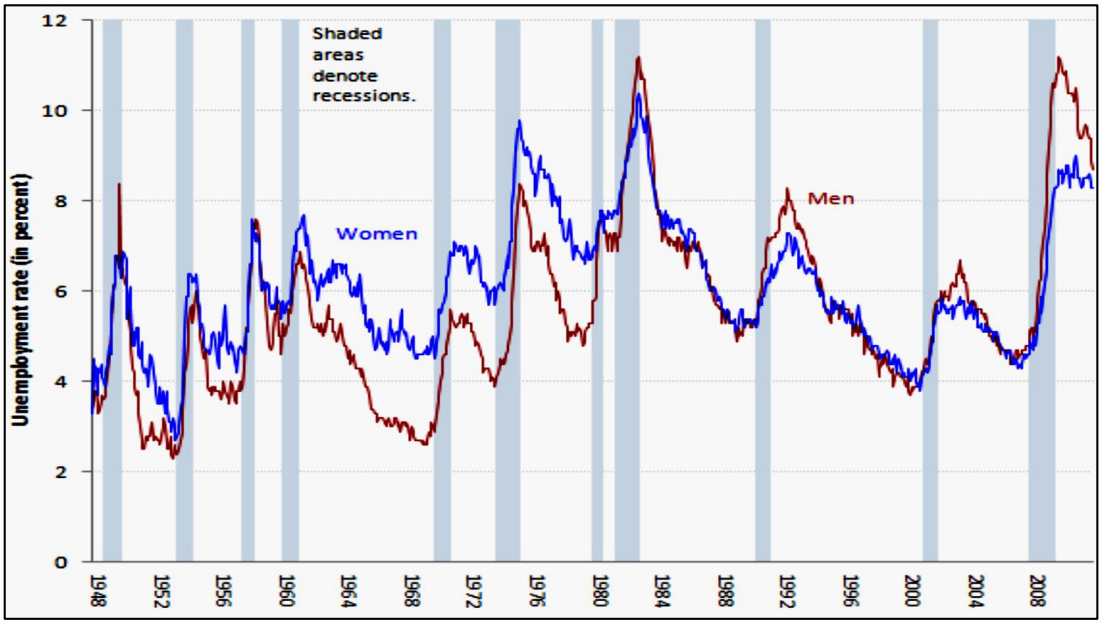

Figure 3: Unemployment rates by sex during 1948-2011 *(Source: US Bureau of Labour Statistics, 2012)*

Knotek II and Terry (2009) showed that during the last 40 years of recession in the USA, the unemployment rate varied from 1% to 4%, while those recessions of 1973-75 and 1981-82 lasted longer than the average post-war recession, i.e., 16 months or longer than the average of 10 months. The last recession of 2007 reached a peak level and was the longest since the Great Depression, followed by 1981-82. This is explained in Figure 4.

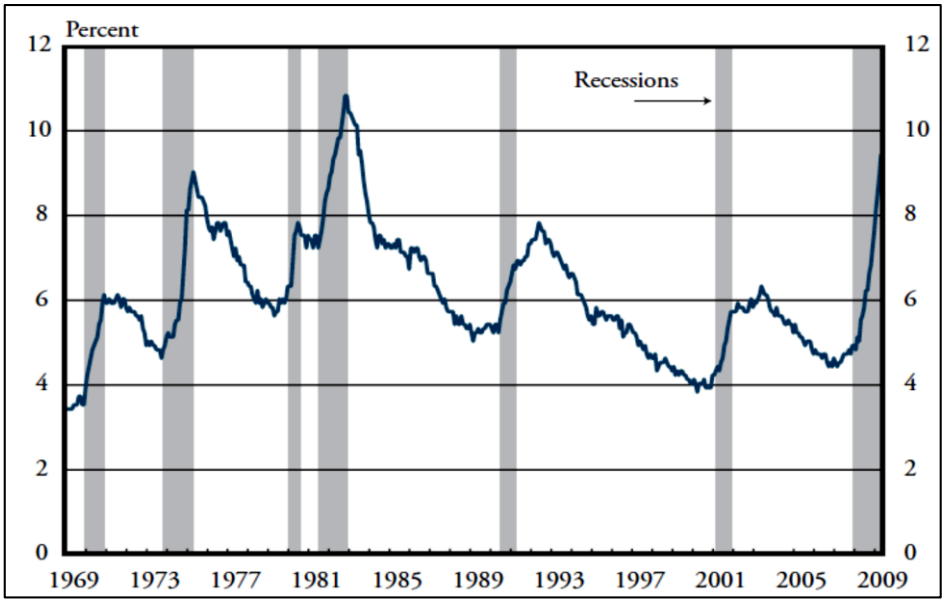

Figure 4: US unemployment rate during recessions *(Source*: *Knotek II & Terry, 2009)*

The decline of GDP growth was 1.7% in the average post-war recessions, where the declines of GDP growth rates in 1973–75 and 1981–82 were 3.1 and 2.6 percent, respectively. In the current recession, GDP had dropped 2.2 percent through the first quarter of 2009. The growth rate of GDP decline during this recession would be larger if not for strong growth in the second quarter of 2008.

In all three recessions, the unemployment rate has experienced strong increases. The changes in unemployment relative to its level during the month of the NBER-defined business cycle peak. The current recession's unemployment path, for example, is normalised by subtracting 4.9 percent (the December 2007 unemployment rate) from subsequent readings. Through May 2009, the unemployment path remained very close to those of the 1973-75 and 1981-82 recessions.

The following Figure 5 verified the business cycle peak in which the unemployment rate reached 4.9% in the 2007 recession, though in 2009, the rate was very close to the 1973-75 and 1981-82 recessions in which unemployment rates fell sharply. After the 1973–75 recession, the unemployment rate drifted down slowly, and after four years of the 1981–82 recession, the unemployment rate returned to the pre-recession level.

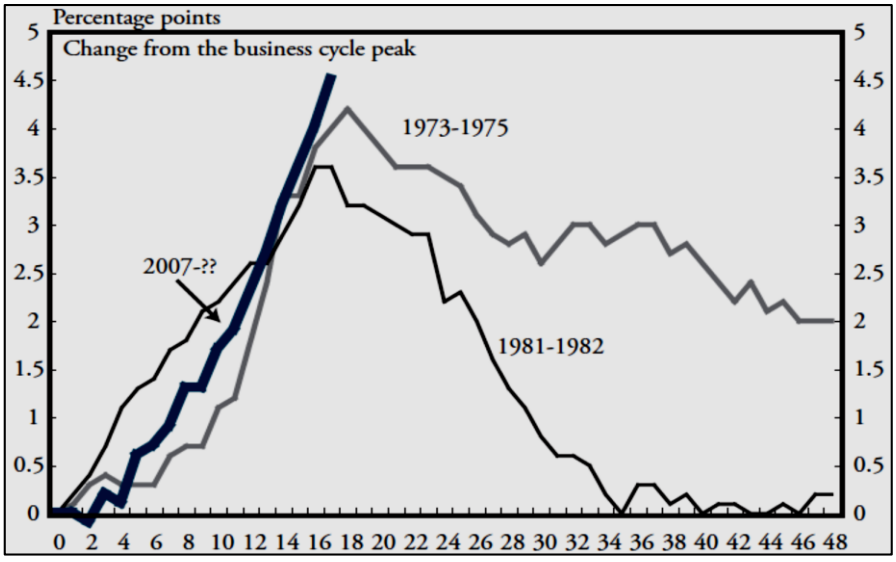

Figure 5: US unemployment paths and severe recessions *(Source: Knotek II & Terry, 2009)*

Congressional Research Service (2021) reproduced that US unemployment rates consist of 12 peaks and 13 troughs during the cycles, while peak unemployment rate occurred in the COVID-19 recessionary period followed by the 1980s recession, while during 2005-2021 unemployment rate peaked in the April 2020 recession followed by the 2009 October recession (Figures 6 and 7).

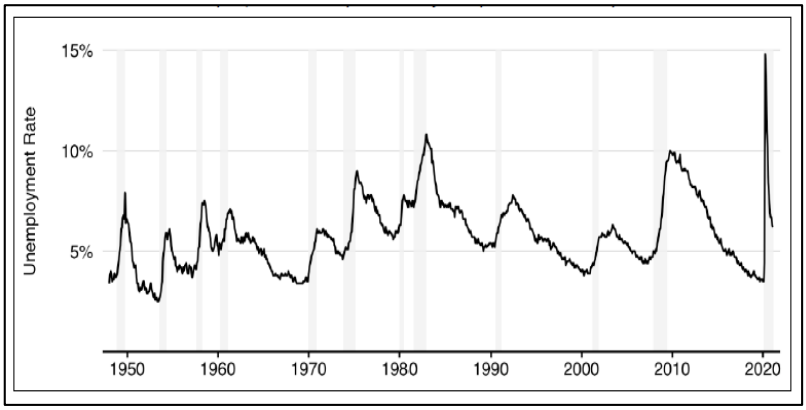

Figure 6: Historical unemployment rate,1948-2021 *(Source: CRS, 2021)*

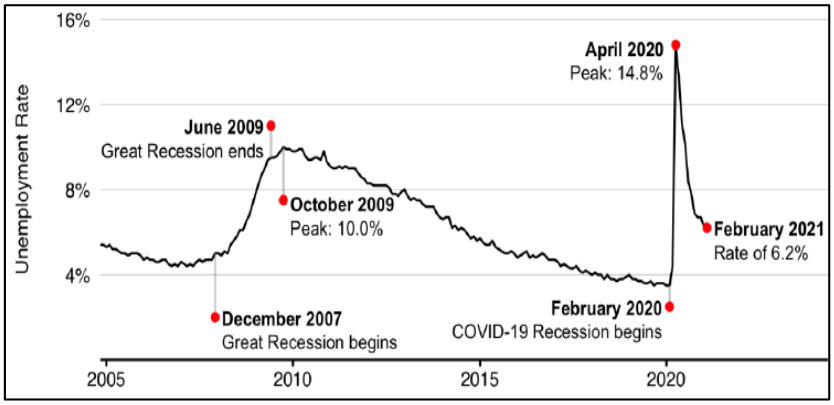

Figure 7: US unemployment rate 2004-2021 *(Source: CRS, 2021)*

Tasci (2011) observed that in the US economy, under recessions, the unemployment rate rose successively. It rose above 9% during the recession and stayed for the past 20 months. The unemployment rate at great depression was higher than the recession in 1982. The rate typically peaks about 15 months after the beginning of the recession, or 4 months after the end of the recession, and then starts to drop gradually over time as the economy recovers. In the US economy, the cause of the rise in unemployment rate is mostly cyclical (Figure 8).

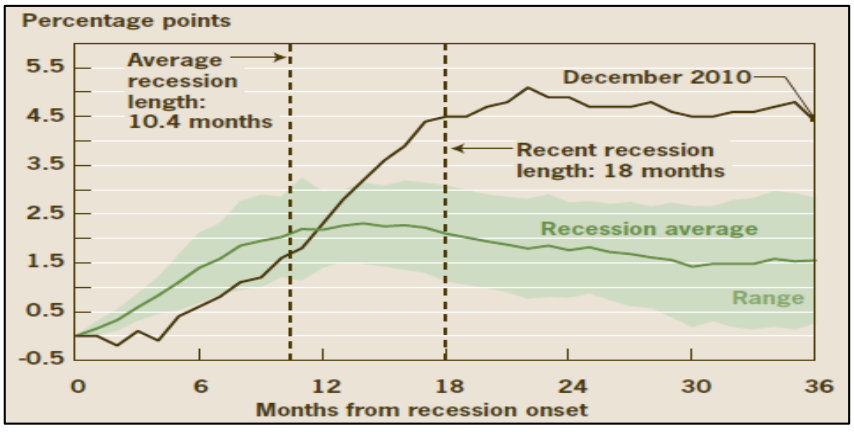

Figure 8: Cumulative increase in the unemployment rate *(Source: Tasci, 2011)*

Tasci and Zaman (2010) verified that the average duration of unemployment is directly related to the unemployment rate during the course of the recession in the USA, which implies that when the unemployment rate increases during a period of recession, the duration also increases. In the 1980s and 2008, the durations were longer than other recessions (shaded portions). It is seen in Figure 9.

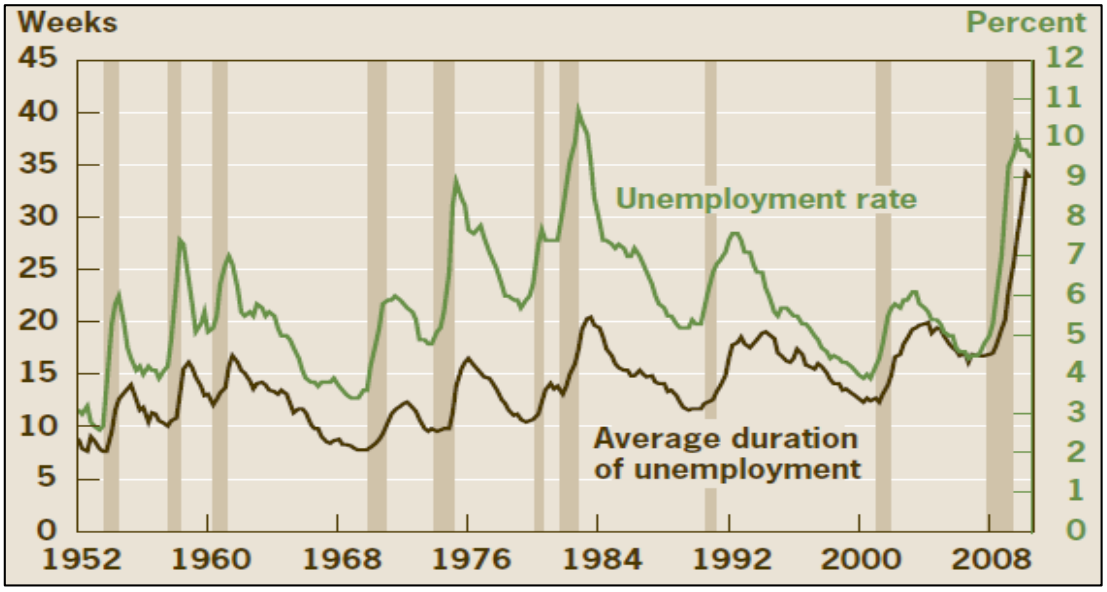

Figure 9: Unemployment rate and duration *(Source: Tasci & Zaman 2010)*

Even when the gap between the unemployment rate and natural unemployment gradually increases, the shock tends to be higher during periods of recessions. The gaps are crucially longer in the 1980s and 2008 in the USA than in other recessions (shaded areas) (Figure 10).

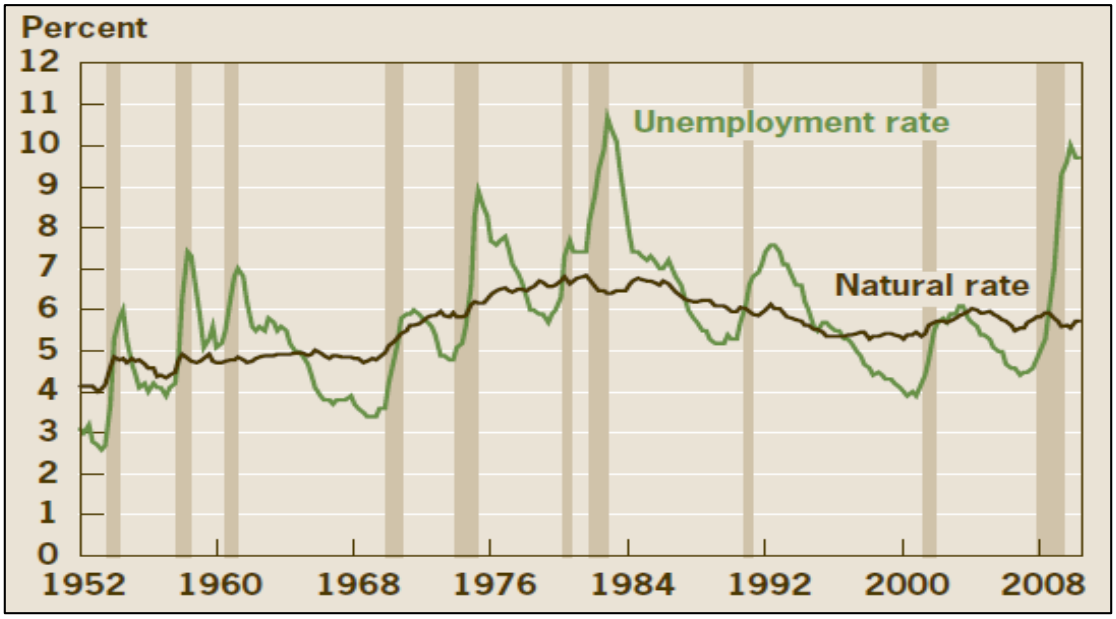

Figure 10: Unemployment rate and natural rate *(Source: Tasci and Zaman 2010)*

Farooq and Kugler (2015) showed that during the recessions in the US, the unemployment rate reached its peak of 10.7% in 1980, followed by 10.0% in 2007 and 8.9% in 1973. On the other hand, the lowest unemployment rate in the recovery was 2.6% in 1948, followed by 3.7% in 1960, 4.0% in 1953, and 4.5% in 2001, respectively. The drop of 4.2 percent after the recession is higher than the average drop of 2.75 percent over the last nine previous recessions. The recovery has been particularly slow, and the fall in the unemployment rate has been greater during these most recent recovery periods. The

lowest unemployment rate before the recession was 4 in 1957, whose highest rate was 7.4 at the end of the recession, so the difference between peak and trough was 3.4, followed by 4.1 in 1973, 4.8 in 1980, and 5.5 in 2007, respectively. On the contrary, the highest unemployment before recession was 10.7 in 1980, whose lowest unemployment after recession was 6.6, so that the gap between peak and trough was 4.1, followed by 4.2 in 2007 and 4.4 in 1948, respectively. The details explanation is found in Table 1 below.

Table 1: Changes in unemployment rates during each post-war recession and recovery

Recession	Lowest unemployment rate in the year before start of recession	Highest unemployment rate during or after the official end of recession	Difference from trough to peak
Nov 1948	3.7	7.0	3.3
July 1953	2.6	6.0	3.4
Aug 1957	4.0	7.4	3.4
April 1960	5.2	7.0	1.8
Dec 1969	3.4	6.0	2.6
Nov1973	4.8	8.9	4.1
Jan 1980	5.9	10.7	4.8
July1990	5.3	7.6	2.3
Mar 2001	3.9	6.2	2.3
Dec 2007	4.5	10.0	5.5
	Highest unemployment rate during or after the official end of recession	**Lowest unemployment rate in the recovery (up to 6 years after the recession)**	**Difference between peak to trough**
Nov 1948	7.0	2.6	4.4
July 1953	6.0	4.0	2.0
Aug 1957	7.4	5.1	2.3
April 1960	7.0	3.7	3.3
Dec 1969	6.0	4.8	1.2
Nov1973	8.9	5.7	3.2
Jan 1980	10.7	6.6	4.1
July1990	7.6	5.0	2.6
Mar 2001	6.2	4.5	1.7
Dec 2007	10.0	5.8	4.2

Source: Farooq & Kugler, 2015

In Figure 11, it is verified that the unemployment rate in the USA prevails in every recession, where the peak level of unemployment reached in the 1980s, followed by 2009, 1975, 1970, and so on.

Figure 11: US unemployment rate, 1965-2013 *(Source: Farooq & Kugler, 2015)*

Ahmed and Nasser (2023) examined the relationship between the unemployment rate and the current account balance to GDP ratio in the United States from 1948Q1 to 2020Q1 during recessions and found that there were several episodes of decreasing unemployment rate coincide with deteriorating current

account balance to GDP ratio. Even there, it was evident that the current account balance is improving when the unemployment rate is rising. Since mid-1980s, the current account balance has been dwindling except in the early 1990s, when the balance was positive during a recession. It coincides with a recession when the unemployment rate increased speedily with an improving current account balance. The authors observed that the current account balance improved during the 'Great Recession' when the unemployment rate was rising. The estimates from the threshold vector error-correction model indicated that both the unemployment rate and the current account balance to GDP ratio deteriorated to maintain the long-run equilibrium relationship in the short run when the error-correction term is above the threshold level. It indicated that the decreasing unemployment in the economy increases the aggregate spending, which deteriorates the current account balance in the United States (Figure 12).

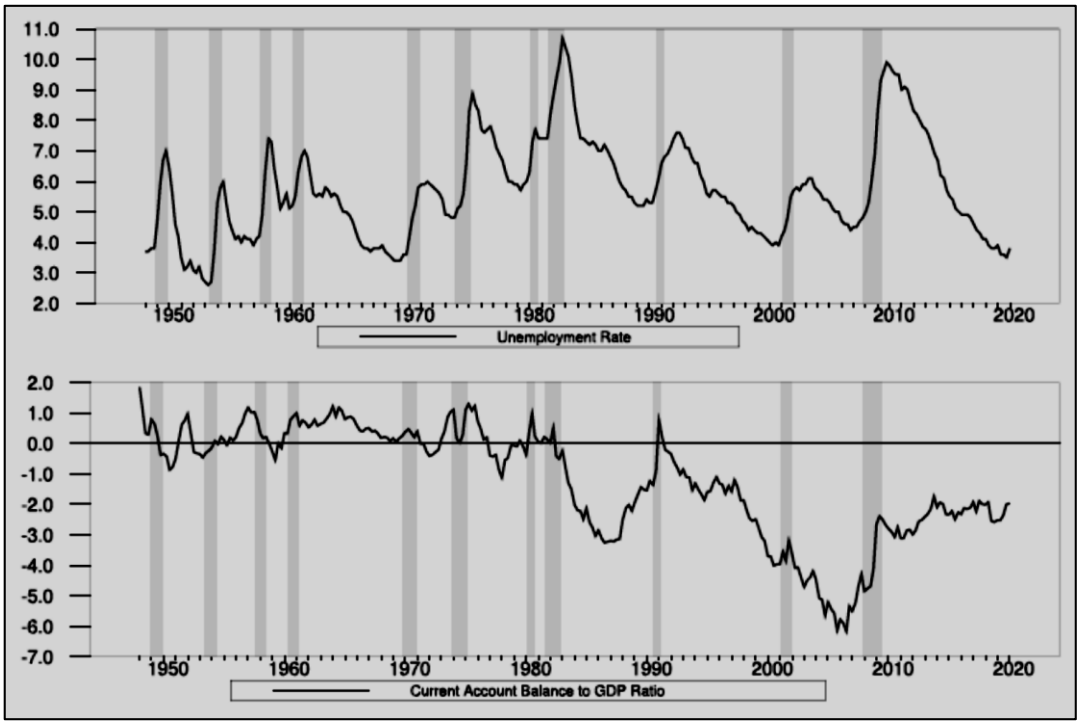

Figure 12: Unemployment rate and current account balance to GDP ratio *(Source: Ahmed & Nasser, 2023)*

Sanchez and Liborio (2012) verified that Okun's law was not useful for predicting changes in the unemployment rate either during the recent recession or recovery. Okun's law revealed that a 1 percent decrease in GDP has been associated with a slightly less than 2-percentage-point increase in the unemployment rate. But during 1949–2011 in the US, it was observed that a decrease in GDP corresponded to a higher increase in the unemployment rate than Okun's law would predict. In 2009Q4, with only a 0.5 percent decrease in GDP, the unemployment rate rose by 3 percentage points relative to 2008Q4. This pattern is reversed in 2011 Q4, where a modest increase in GDP was accompanied by a decrease in unemployment significantly larger than the pre-Great Recession relationship. Between 2009Q4 and 2011Q4, a 0.4 percentage-point increase in the unemployment rate corresponds to a roughly 1 percent decrease in output. The most recent trend, thus, is significantly steeper than the one experienced in the past (Figure 13).

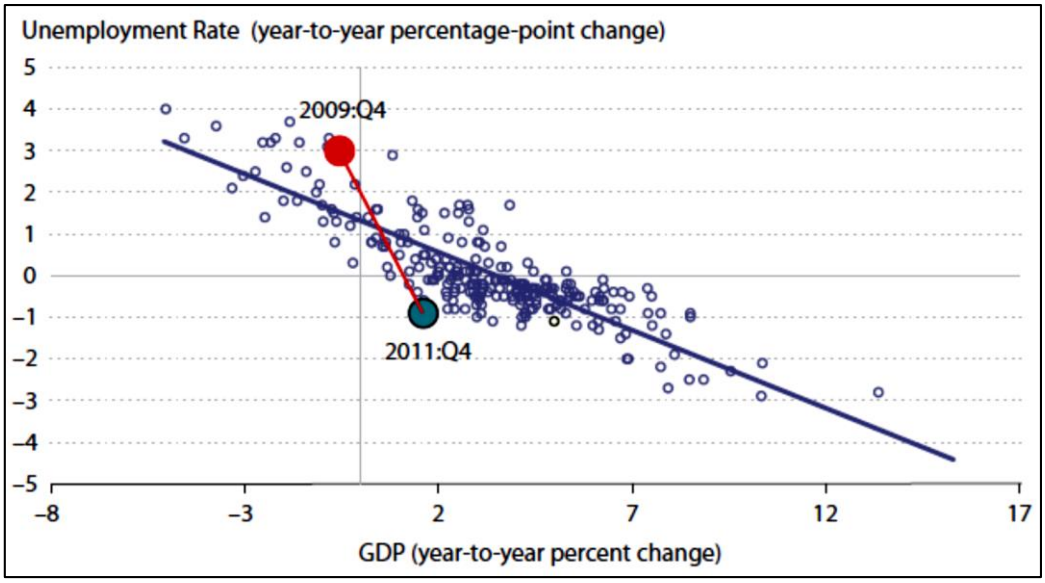

Figure 13: Changes in the unemployment rate and GDP, 1949-2011 *(Sources: Sanchez & Liborio, 2012)*

Bosh *et al.* (2015) verified again that the pre-post-World War II USA unemployment rate reached a peak level of more than 20% during 1935, followed by 12% during 1895–1898, while after post-World War II recessions, the unemployment rate reached 10% in the 1980s and 2008–09 recessions, respectively, followed by 1975 and 1992 (Figure 14).

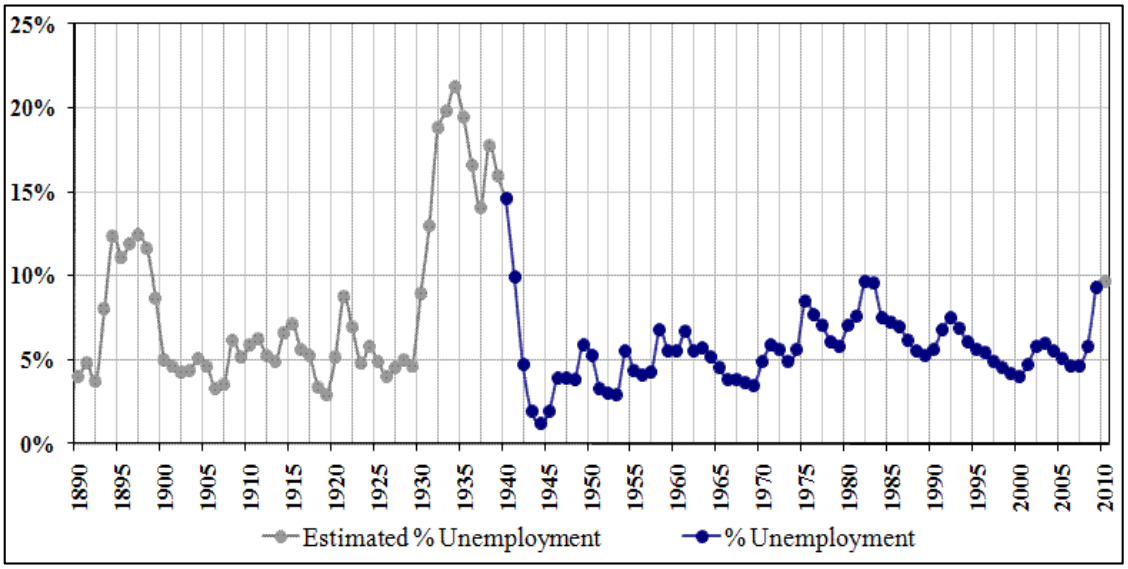

Figure 14: US unemployment rate 1890-2009 *(Source: Bosh et al., 2015)*

Aaronson, Laforte and Mawhirter (2014) concluded that it is historically true that an increase in the unemployment rate of more than 0.4 percentage point over a three-month period has always been followed by a recession. While there are rare cases of monetary tightening during recessions, there are instances where a low inflation rate resulted in low unemployment in the recession. During 1940-2024, there are 11 incidents where an increase in the 3-month moving average of the unemployment rate of at least 0.3 percentage point preceded or coincided with a recession, while two cases did not increase in unemployment when recessions occurred. As regards the link between recessions and monetary policy, it asserts that the timing of the unemployment rate increases with monetary policy contractions, according to Romer and Romer (1989), who say dates account for six or seven of the nine post-war recessions through the early 1990s, depending on whether the 1981 recession is attributed to the 1979 tightening, but it is not true in the 1953 or 1960 recessions. But New York Fed staff examined the

outcomes of 14 monetary tightening cycles between 1955 and 2006 and found that 11 of the 14 tightenings in their sample are related to a higher unemployment rate, in which 10 out of 11 were associated with NBER recessions. Figure 15 explained the above results.

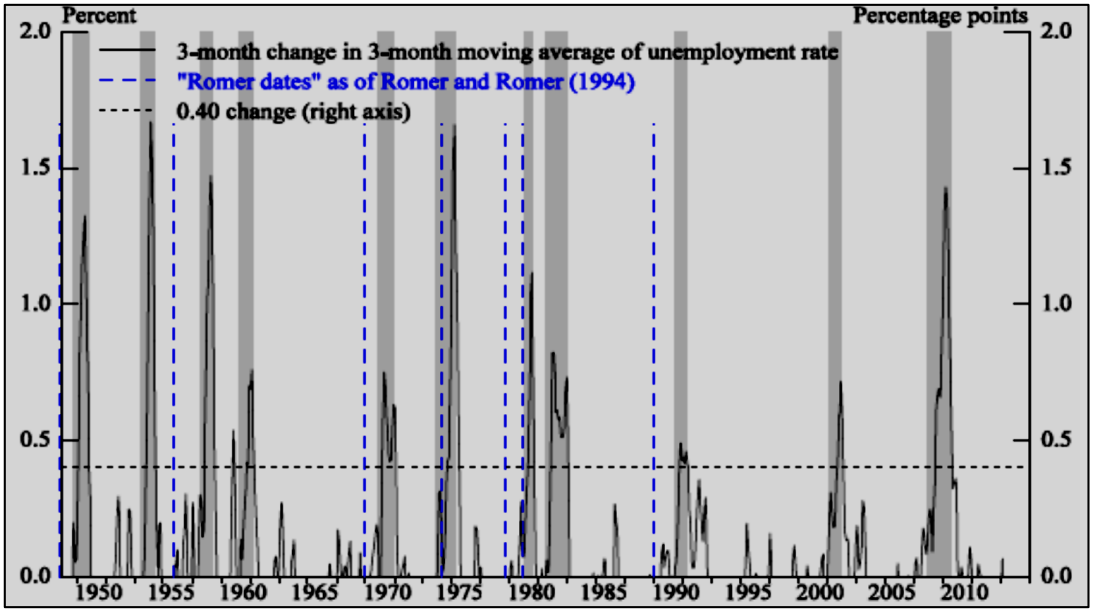

Figure 15: Smoothed increases in unemployment rates *(Source: Aaronson, Laforte & Mawhirter, 2014)*

Hout and Cumberworth (2012) showed that cyclical women unemployment is higher than men during 1948-1980, while the rates are identical or higher in men than women during 1980-2012. This finding is true in the USA under the periods of recessions from 1948 to 1980 and from 1980 to 2012. In all the recessionary periods, unemployment rates have been shooting up. It is seen in Figure 16.

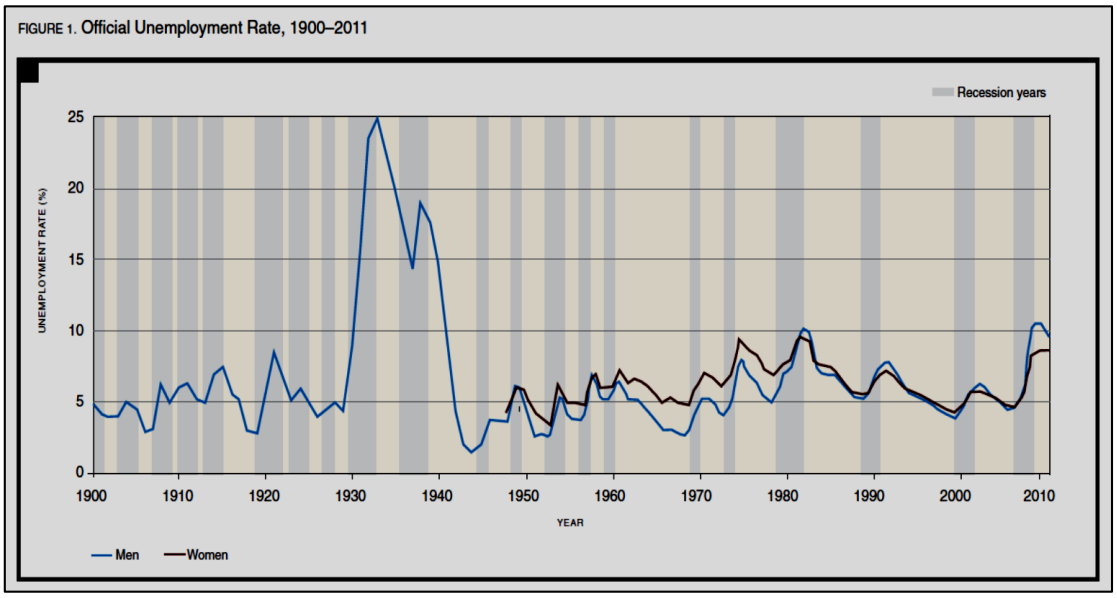

Figure 16: US Unemployment rate 1900-2012 *(Source: Hout & Cumberworth 2012)*

Levine (2013) emphasised that during the 1949-2009 recessions in the USA, the recovery months from recession were highest at 21 months in November 2001, followed by 17 months in 1991 March, 12 months in 2009 June, and 11 months in the 1970 November recession, and the minimum months of recovery were 2 months in 1980 July, followed by 4 months in 1949 October and 1975 March, respectively. Table 2 explained it in detail

Table 2: Months between the start of a recovery and two successive declines in unemployment rate

Date of start of recovery	Months after recovery's start and two successive declines in unemployment rate
October 1949	4
May 1954	6
April 1958	5
February 1961	9
November 1970	11
March 1975	4
July 1980	2
November 1982	5
March 1991	17
November 2001	21
June 2009	12

Source: Levine (2013)

Objective

The paper tries to explore the relevant nexus between the movements of the unemployment rate and the GDP growth rate of India in the course of recessions in India during the post-independent period from 1951 to 2023. How did recessions indicate the unemployment rate was introduced through the cyclical behaviour of unemployment rate and GDP growth rate, respectively.

Relation between Recession and Unemployment in India

Methodology and sources of data

Decomposition of unemployment rate and GDP growth rate into cycles, cyclical trends and seasonal variations has been conducted by using the Hamilton (2018) regression filter model for the data from 1951 to 2023 in India. The residual of the regression filter during the specified period has been transformed into decomposition of cycles, cyclical trends and seasonal variations by applying the STL method, which was done by Cleveland *et al*., (1990). Recessions and economic crises were marked by vertical shaded lines in 1957, 1965, 1966, 1972, 1979, 1988–86, 1991, 2005–06, and 2020, respectively. The data on GDP growth rates (in %) from 1961 to 2023 and unemployment rate (in %) from 1991 to 2023 for India were collected from the World Bank. The data on the GDP growth rate from 1951 to 1960 were collected from the EPW research foundation. The data on the unemployment rates of 1st, 2nd, 3rd, and annual plans were taken from Dutt and Sundaram (1998). Data on unemployment rates from 1970 to 1990 were collected (Krishna, 1984; West Cott & Bednarzik, 1981; NSS 68th round (2011-12), respectively. Unemployment data of the U.K. from 1900 to 2023 were collected from the Federal Reserve Bank of St. Louis.

Observations and findings

India's peak levels of unemployment rates in 1957, 1965, 1966, 1972, 1979, and 2020 have occurred due to successive recessions (marked by shaded green lines) and other peak levels of unemployment rates occurred due to economic crises (shaded ash lines) in 1985-86, 1991, and 2005-06, respectively. Thus, there was a direct relationship between the recession and unemployment, which implies that recessions lead to unemployment. Even economic crises also lead to unemployment in India, like in other countries as well. In all recessions, India has fallen into negative GDP growth rates, and in other economic crises, India's GDP growth rates dwindled. In the economic crises, female unemployment rates were higher than male unemployment rates, while in COVID-19, male unemployment rates exceeded female unemployment rates in the recession. During the pre-reform period, the unemployment rate (x) revealed nine peaks and nine troughs, and during the post-reform period, it showed three peaks and two troughs. Female unemployment rate (x_2) showed one peak, one trough, while male unemployment rate (x_1) showed two peaks and one trough (Figure 17).

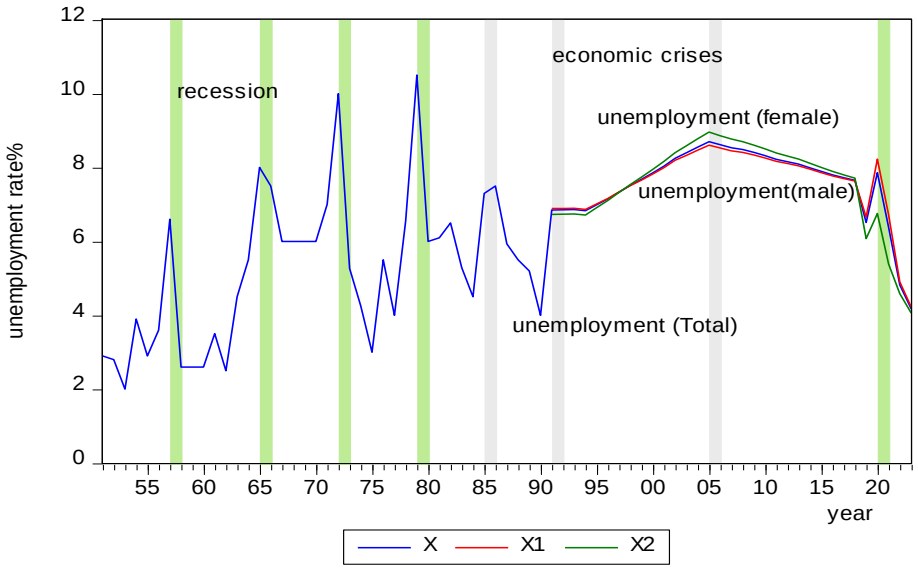

Figure 17: Unemployment rate and recessions

The recessionary cycles were represented by the GDP growth rate (y) along with the unemployment rates (x) of India during 1951-2023, which are consistent with recessions and economic crises in the respective years, such as 1957, 1965, 1966, 1972, 1979, and 2021, indicated by recessions and 1985, 1991, and 2005-06, indicated by economic crises in which unemployment rates reached peak levels and the GDP growth rate became negative or started to fall (such as 2005-2006). In 1985-86, India was confronted with a shortfall of foreign exchange reserves, export growth, rising CPI and WPI, food prices and the negative impact of floods, which had a negative impact on the GDP growth rate and a positive impact on the unemployment rate. In 1991, India faced oil crises, fiscal deficit and BOP deficit and Gulf War, while in 2005-06, India was in trouble of housing bubbles, subprime crises, yield curve inversion and stock market crashes with the oil crisis. All the economic crises led to a high unemployment rate with declining growth rates (Figure 18).

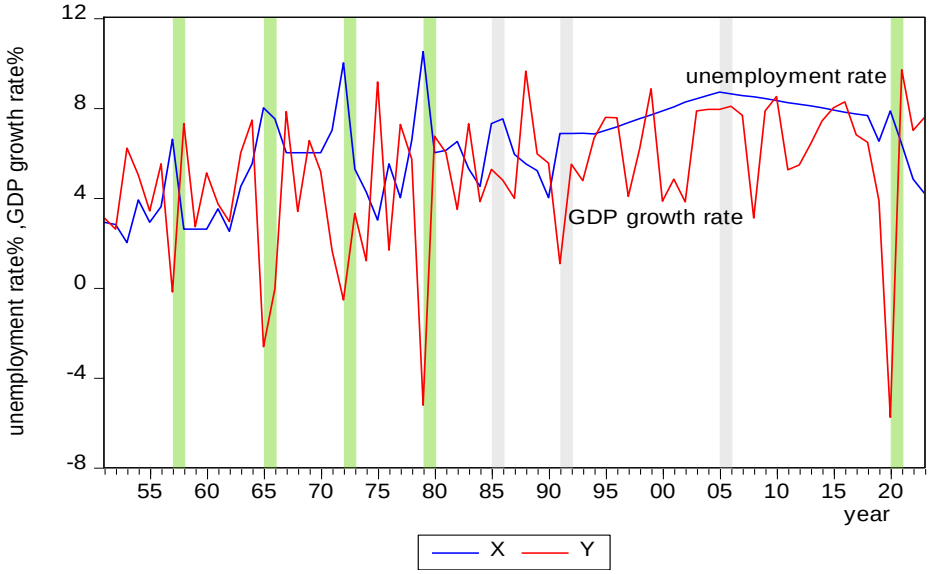

Figure 18: Growth unemployment in India in recessions

In the Hamilton regression filter model (2018), when the unemployment rate is decomposed into cycles, cyclical trends and seasonal variations, it is observed that the peaks of unemployment rates are seen in the 1957, 1965, 1966, 1972, 1979, and 2021 recessions and in the 1985-86, 1991, and 2005-06 economic crises in India (panel 1, Figure 19), where these findings are also true in cases of V-shaped cyclical variations in the peaks (in panel 3, Figure 19). The cyclical trend of unemployment rate in India

during 1951-2023 and the upswing of the cycle revealed the recessions and economic crises in the respective years except in 1972 and 2020 (panel 2, Figure 19).

The model of Hamilton regression filter along with its residual(v_{1t}) is given below.

$V_{1t}=x_t-[2.897+0.126x_{t-4}-0.167x_{t-5}+0.2109x_{t-6}+0.412x_{t-7}]$

R^2=0.381, F=9.423*, DW=0.74, n=73, x=unemployment growth rate in India, *=significant

V_{1t} is decomposed by STL method.

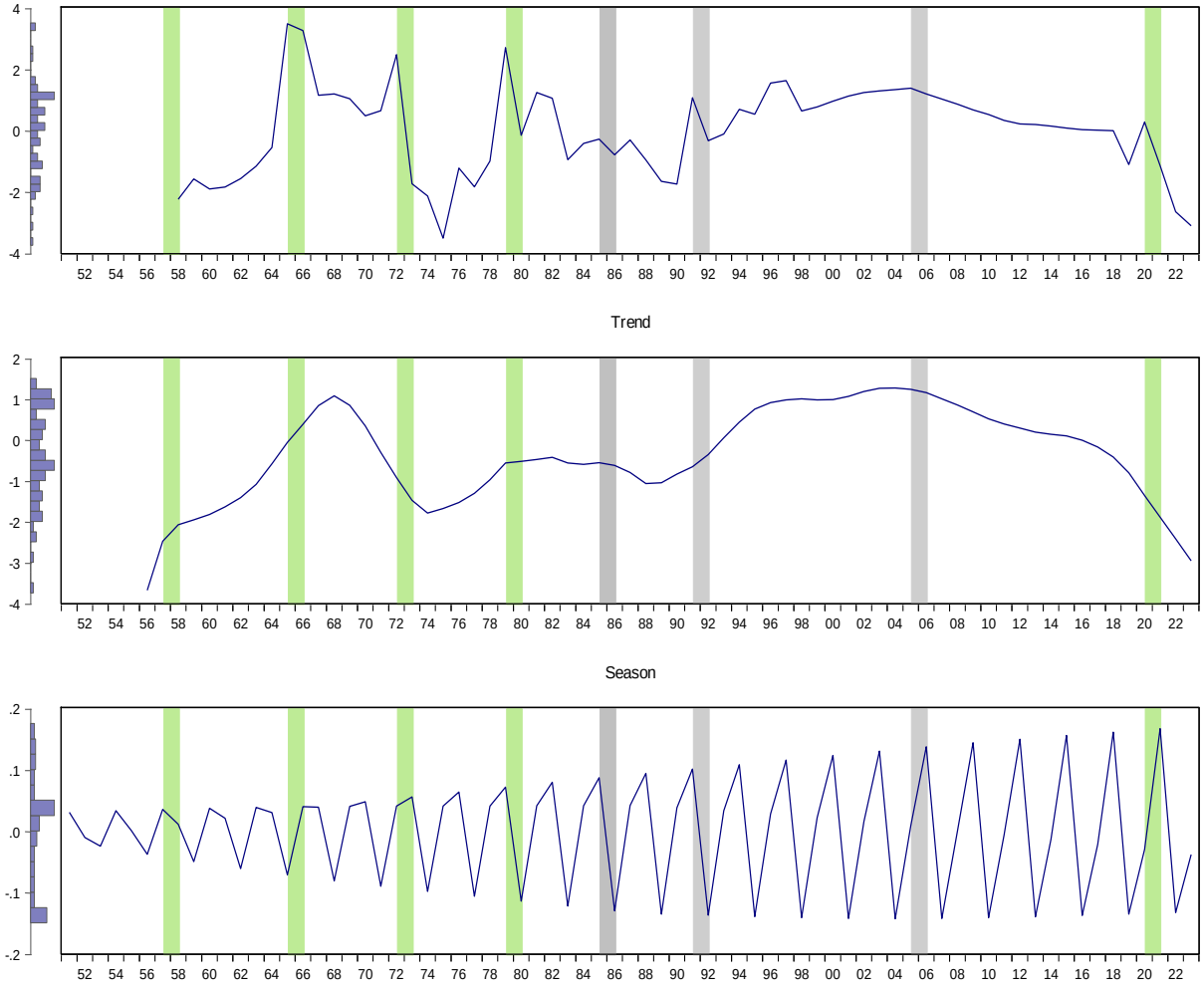

Figure 19: Cycles of unemployment rates and recessions

Again, in the Hamilton regression filter model (2018), the decomposition of GDP growth rates in India from 1991 to 2023 showed that every recession and economic crisis is accompanied by troughs or downswings of the cycles except in 2005–2006 (panel 1, Figure 20). Moreover, in the cyclical trend of the GDP growth rate, recessions and economic crises are typically associated with the troughs or downswings of the trend, with the exception of the years 1985-86, 2005-06, and 2020, as depicted in Figure 2. The peaks or upswings of the V-shaped seasonal variations were seen every recession and economic crisis in India from 1951 to 2023 (panel 3, Figure 20).

The model of Hamilton regression filter including its residual (v_{2t}) is given below.

$V_{2t}=y_t-[2.807-0.154y_{t-4}+0.1617y_{t-5}+0.246y_{t-6}+0.214y_{t-7}]$

R^2=0.122, F=2.12, DW=2.20, n=73, y=GDP growth rate in India

V_{2t} is decomposed by STL method.

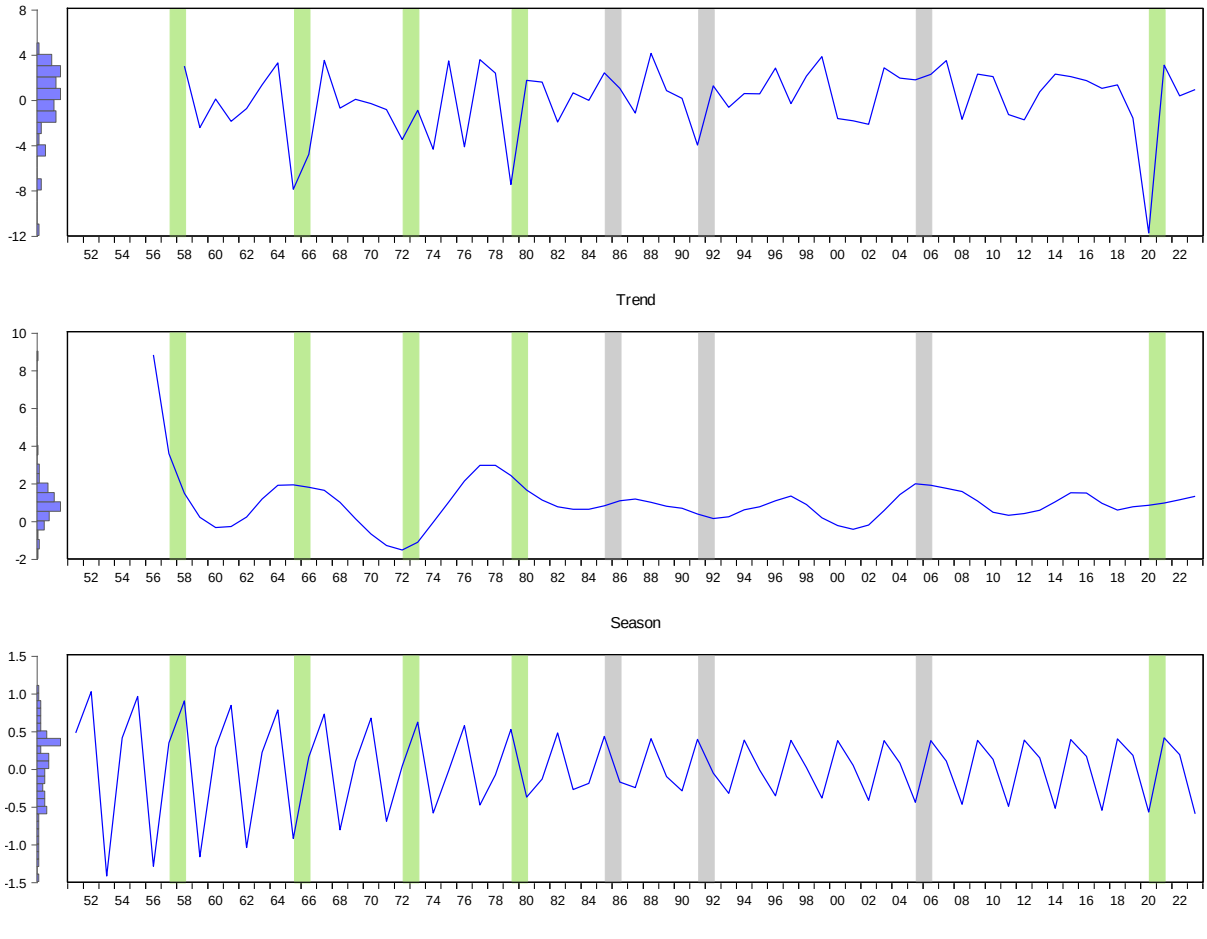

Figure 20: Recessions and Growth rate cycles

The peaks of unemployment rates have been significantly related with the troughs of GDP growth rates during the cyclical movements from 1951 to 2023 in India, which are clearly visible in Figure 21 below. There are 20 peaks and 20 troughs in GDP growth cycles and 12 peaks and 12 troughs in unemployment cycles.

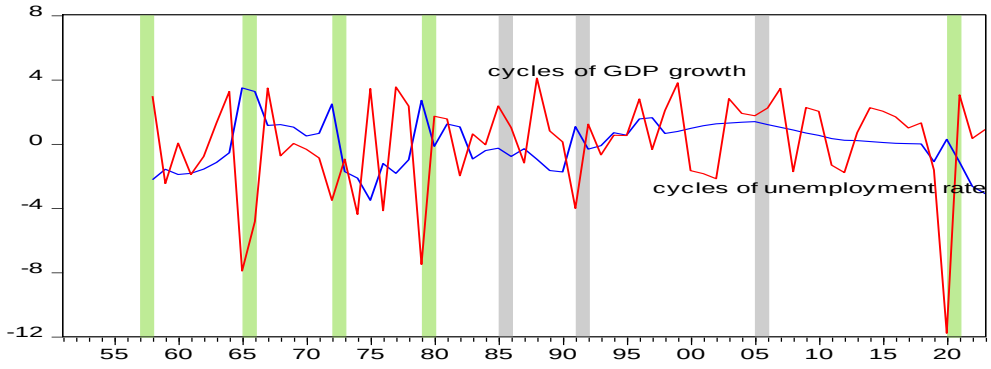

Figure 21: GDP growth and unemployment cycles

The cyclical trends of unemployment rate and GDP growth rate in India during 1951-2023 expressed that the upswing cyclical trend of unemployment rates is significantly consistent with the downswings of the GDP growth rates except in 1985-86 and 2020, which is clearly plotted in Figure 22, where the unemployment cyclical trend consists of 3 peaks and 2 troughs while the cyclical GDP growth rate consists of 6 peaks and 7 troughs.

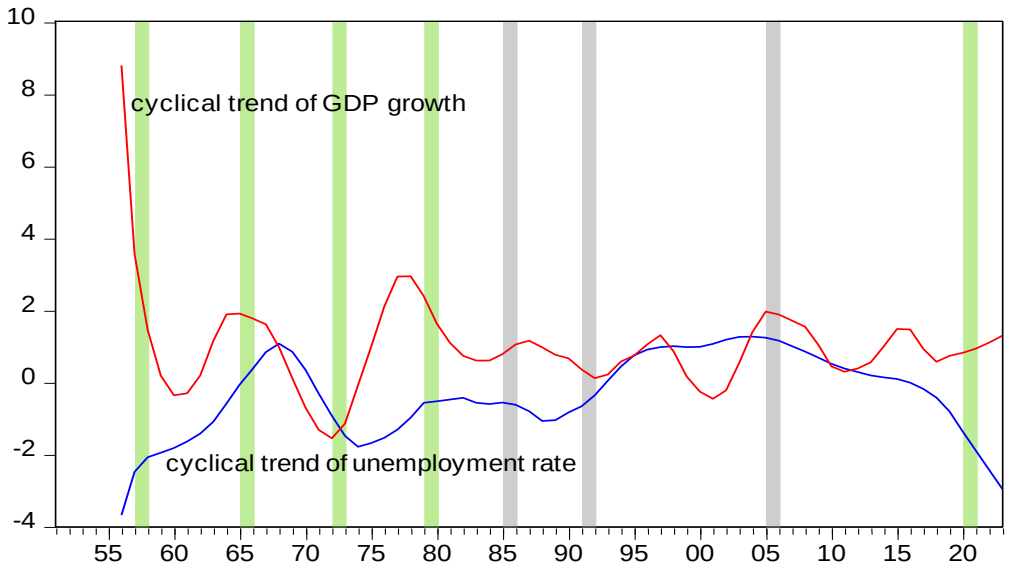

Figure 22: Cyclical trends of GDP growth rate and unemployment rate

Discussion

Kannan, Scott and Terrones (2012) opined that countercyclical monetary policy is helpful to shorten recessions but has little effect on financial crises, while both countercyclical monetary and fiscal policy can be effective to minimise adverse impacts in boosting recoveries. In last recessions in OECD countries, the policy of "spender of last resort." was very effective. Romer and Romer (1989, 2007) prescribed that a higher unemployment rate during US recessions can be challenged through tightening monetary and fiscal policy.

During Indian economic crises in 1991, economic reform policy was effective for the long run; in the 1966 recession, the devaluation policy was less effective in curving duration; in the 1957 recession, huge deficit financing and industrialisation in expansionary monetary policy were effective for the short run; in economic crises in 1979, 1985, 2005, and 2006, government expansionary fiscal policy to stop the downswing of growth and the upswing of the unemployment rate were partly successful. On the other hand, Indian monetary policy was successful in countering the impact of the world financial crisis in India, and both fiscal and monetary policy were successful in handling the recession in COVID-19. Kumar and Vashisht (2009) said that during the period of India's downswing growth rate in GDP in 2004–2005 and a rise in inflation rate, the RBI started tightening monetary policy in September 2004, raising the cash reserve ratios from 4.5% to 5.0%, but when the inflationary situation worsened in the subsequent period, the tightening of monetary policy became even more aggressive. To counter the world financial crisis, the RBI has injected a considerable amount of liquidity into the economy through a series of policy rate cuts since October 2008. Moreover, the Reserve Bank of India has also liberalised the ECBs and FII-related rules and conditions. The Hamilton decomposition model (2018) led to the conclusion that the peaks and troughs of unemployment rates are correlated with the troughs and peaks of GDP growth rates during economic cycles and cyclical trends, particularly when recessions impacted the economy.

Conclusion

In analysing the relationship between unemployment rate and recession in India from 1951 to 2023, the graphical representations allowed us to insert that India's unemployment peaks are associated with the recessions and economic crises during the years of 1957, 1965, 1966, 1972, 1979, 1985, 1991, 2005-06 and 2020, respectively, where recessions are verified by negative GDP growth rates and economic crises are verified by declining or downswing GDP growth rates. Male unemployment rates in peaks are higher than the female unemployment rate during the 1991 and 2020 crises, while the female unemployment rate in peak was higher than the male in the 2005-06 economic crisis. The peaks of v-

shaped seasonal variations of unemployment rates are associated with recessions and economic crises in India during the above periods. The findings are identical with the UK and US unemployment rate nexus with recessions during long period cycles, which are studied from a review of literature.

Conflict of Interest

There is no conflict of interest in publication of the paper on behalf of the association.

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